

### *Claims*

- 1 1. A method for determining the corrosion of a material in an environment using a  
2 corrosion coupon placed in the same environment, comprising the steps of:
  - 3 (a) placing said corrosion coupon in said environment;
  - 4 (b) sensing the failure of said corrosion coupon, wherein said failure is indicated  
5 by a movement of a magnet, creating a magnetic field which may be sensed  
6 without effecting said material;
  - 7 (c) sensing said magnetic field, wherein said magnetic field has a characteristic  
8 indicative of said failure, thereby producing a measurable external magnetic  
9 field at a distance from said corrosion coupon; and
  - 10 (d) responding to said external field to display an indication of said failure.
- 1 2. A method as recited in claim 1, wherein said method measures the amount of  
2 corrosion because the physical condition of the corrosion coupon is known before the coupon  
3 is inserted into said environment.
- 1 3. A method as recited in claim 2, wherein said method measures the rate of corrosion  
2 because the time to failure while in said environment is determinable.
- 1 4. A method as recited in claim 1, wherein the failure of said coupon is determined  
2 without penetrating a wall separating the location of said coupon from the location of said  
3 display.
- 1 5. A method as recited in claim 1 wherein said method uses a plurality of corrosion  
2 coupons.
- 1 6. A method as recited in claim 1 wherein said material to be monitored for corrosion is  
2 located in a radioactive environment containing an element selected from the group  
3 consisting of plutonium and uranium.
- 1 7. A method as recited in claim 1 wherein said magnet is moved by a spring attached to  
2 said coupon that is in compression until the coupon fails.
- 1 8. A method as recited in claim 7 wherein said spring applies a compressive force to said

2 coupon.

1 9. A method as recited in claim 1 wherein said magnet is moved by a spring attached to  
2 said coupon that is in tension until the coupon fails.

1 10. A method as recited in claim 10 wherein said spring applies a tension force to said  
2 coupon.

1 11. A method as recited in claim 1 wherein said magnet is moved by Belleville washers  
2 under compression and applying stress to said coupon until said coupon fails.

1 12. A method as recited in claim 1 wherein said magnet is moved by Belleville washers  
2 under tension and applying stress to said coupon until said coupon fails.

1 13. A method as recited in claim 1 wherein said responding includes a magnet positioned  
2 exterior to said container aligning itself with said exterior magnetic field.

1 14. A method as recited in claim 1 wherein said responding includes at least one coil that  
2 can be used to sense said exterior magnetic field.

1 15. A method as recited in claim 1 wherein said responding includes a magnetoresistive  
2 device that can be used to sense said exterior magnetic field.

1 16. An apparatus for determining the corrosion of a material in an environment, using a  
2 corrosion coupon placed in the same environment, comprising:

- 3 (a) transmitter apparatus for placement in the environment containing said  
4 material, including  
5 (i) a corrosion coupon mounting system with at least one with corrosion  
6 coupon;  
7  
8 (ii) a transducer apparatus responsive to the position of each coupon to  
9 provide a corresponding position of a mechanical element;  
10 (iii) a transmitter magnet attached to each element for radiating a magnetic  
11 field characteristic corresponding to the position of each element, said  
12 magnetic field including an external magnetic field component that can

13                                be sensed at a distance from said element;  
14                (b)        receiver apparatus for placement at a distance from the transmitter apparatus,  
15                                said receiver apparatus including  
16                                (i)        receiver magnetic field sensing apparatus that measures a detectable  
17    characteristic of said external field component;  
18                                (ii)        a display apparatus responsive to a position of said receiver magnet to  
19    provide an indication of said position.

1        17.        An apparatus as recited in claim 16 wherein said receiver magnetic field sensing  
2        apparatus includes a receiver magnet that aligns with said external field component.

1        18.        An apparatus as recited in claim 16 wherein said display apparatus is a mechanical  
2        display.

1        19.        An apparatus as recited in claim 16 wherein said display apparatus is a needle gauge.

1        20.        An apparatus as recited in claim 16 wherein said display apparatus is an electronic  
2        display.

1        21.        An apparatus as recited in claim 16 wherein said transducer apparatus produces a  
2        rotational movement in response to a failure of said corrosion coupon.

1        22.        An apparatus as recited in claim 16 wherein said transducer produces a translational  
2        movement in response to a failure of said corrosion coupon.

1        23.        An apparatus as recited in claim 21 wherein said receiver apparatus senses the  
2        external magnetic field of the rotational movement produced by said transmitting apparatus.

1        24.        An apparatus as recited in claim 22 wherein said receiver apparatus senses the  
2        external magnetic field of the translational movement produced by said transmitting  
3        apparatus.

1        25.        An apparatus as recited in claim 16 wherein said receiver apparatus is a coil that  
2        senses said external magnetic field component.

1 26. An apparatus as recited in claim 16 wherein said receiver apparatus is a  
2 magnetoresistive sensor that senses said external magnetic field component.

1 27. An apparatus as recited in claim 25 wherein said receiver apparatus includes a display  
2 of said sensed external magnetic field.

1 28. The apparatus of claim 16 wherein said transducer produces a rotational movement in  
2 response to a failure of said corrosion coupon.

1 29. The apparatus of claim 16 wherein said transducer produces a translational movement  
2 in response to a failure of said corrosion coupon.